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Non-Lethal Chemical Weapons

LESTER A. WEILACHER  
Major, USAF

Air Command and Staff College  
Elective Paper

MAXWELL AIR FORCE BASE, ALABAMA

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EL 664 (AY03) Issue Analysis, “Non-Lethal Chemical Weapons”  
Submitted by Major JR Weilacher, 03-1636E, 11 April 03

Little more than a month after terrorists took control of four passenger aircraft in the United States and unleashed the horror of 9/11, 50 Chechen terrorists armed with automatic weapons and carrying large quantities of explosives seized the Moscow music theater during an evening performance. The terrorists immediately threatened to kill the theater’s roughly 800 occupants if the Russian government did not cease its military campaign in Chechnya. Although initial negotiations secured the release of some hostages, talks quickly stalled. Facing a protracted standoff and fearing the deaths of the remaining hostages, authorities cleared the way for action by Russian special police units. On October 26, special police units reportedly pumped an incapacitating gas into the theater. During the ensuing operation, police killed all of the terrorists and freed the majority of the hostages. However, 117 of the hostages died from the effects of the gas. (Glasser, 15) While many people credit Russia for making the most out of a no-win situation, others saw the Russian action as a potential violation of the Chemical Weapons Convention (CWC). This controversy continues today as “the United States itself investigates new substances that can be used to disable terrorists-perhaps even battlefield opponents.” (Knickerbocker, 1) More importantly, the Moscow theater crisis, combined with knowledge gained through this elective, sparked my interest in exploring non-lethal chemical weapons. The purpose of this issue paper is to analyze issues related to US military interest in non-lethal weapons with a focus on non-lethal chemical weapons. After establishing a link between non-lethal chemical weapons and weapons of mass destruction (WMD), this paper will examine various reasons why states seek non-lethal weapons capabilities. Next, US military policy and organizational structure for non-lethal weapons development are reviewed with emphasis on recent DoD non-lethal chemical initiatives. Efforts will then shift to explaining what non-lethal

chemical weapons are and describing their characteristics. Subjects addressed include incapacitants and riot control agents (RCAs). Furthermore, this paper examines the CWC and Executive Order 11850 with regard to the legality of developing and using non-lethal chemical weapons. Specifically addressed is whether US initiatives to develop non-lethal chemical weapons technology may represent a violation of international law. Finally, this paper examines recent efforts to develop chemical agents with incapacitating effects and reviews theories to enhance their safety.

The analysis of non-lethal chemical weapons is related to WMD in a number of ways. First, non-lethal chemicals are by definition still chemical agents. Like their lethal counterparts, non-lethal chemical agents including incapacitants and RCAs “produce their effects on a living target by virtue of their toxic chemical properties.” (WMD Terms Reference Handbook, 45) “In fact, a categorical distinction between lethal and non-lethal chemical agents is not scientifically feasible.” (Federation of American Scientists Article, 2) Opponents of non-lethal weapons contend that because certain individuals are more susceptible to some agents, non-lethal chemical weapons can kill them. Using this logic, non-lethal chemical weapons might be more accurately described as less-lethal chemical weapons. Second, all chemical weapons are captured by the CWC and the international norm against the possession and use of WMD. As evidence of the norm against the possession and use of chemical weapons, the CWC has 148 states-parties. Each of these states vows not to use chemical weapons as a method of warfare. Third, non-lethal chemical weapons share the same employment limitations as lethal chemical weapons. As discussed in elective, chemical weapons (lethal and non-lethal) are perhaps better described as weapons of mass disruption as opposed to true WMD. They are relatively easy to defend against through the use of basic defensive measures including gas masks and protective clothing. As a result, lethal and non-lethal chemical weapons may be capable of disrupting or

delaying the actions of modern combat force. However, they will not produce decisive battlefield effects. Therefore, chemical weapons are best suited for use in asymmetric situations.

There are a number of reasons why states seek to acquire non-lethal weapons (NLW) capabilities. First, modern militaries in the 21<sup>st</sup> century are increasingly involved in operations other than war (OOTW). Often, involvement in situations ranging from peacekeeping to humanitarian assistance places forces in situations where the use of lethal force is undesirable. According to the Joint Force Commander's Handbook for Peace Operations, "non-lethal technologies are designed to fill the gap between verbal warnings and deadly force when dealing with unarmed hostile elements." (JTF/CC Handbook for Peace Operations, X-4) For example, during the final withdrawal of US troops from Somalia in early 1995, Lt Gen Anthony Zinni sought non-lethal technologies for use in Mogadishu. "Although the NLW effects were marginal, Lt Gen Zinni's aggressive support added credibility to the NLW effort." (JNLWD website) Second, NLWs may represent a powerful tool in fighting the global war on terrorism (GWOT). According to the National Security Strategy, "we [the US] will not hesitate to act alone, if necessary, to exercise our right of self-defense by acting preemptively against such terrorists." (NSS, 6) But what if this preemptive action takes place on the soil of another sovereign nation? Like Mao Tse-tung speaking of guerillas as fish swimming in the "sea" of the surrounding population (Creveld, 196), the same is true for terrorists. How do we attack terrorists without harming the innocent civilians that may surround them? NLWs present a way to reduce the risk of collateral damage and may make preemption in foreign countries more tolerable to both the affected nation and the international community. Third, regardless of how military force is employed, favorable media coverage is critical to both domestic and international support. "In light of CNN and 'real time' reporting, there is limited tolerance in today's society for the military and law enforcement agencies to use lethal force in other than the

most extreme cases.” (Mears, 12) Non-lethal weapons provide warfighters a capability to achieve desired effects in a hostile situation while denying adversaries casualty footage for use in their propaganda campaigns.

Consistent with the reasons discussed above, the US military is actively pursuing NLW capabilities under the authority of DoD Directive 3003.3, dated 9 July 1996. DoD Directive 3003.3 defines non-lethal weapons as “weapons that are explicitly designed and employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment.” (DoDD 3000.3) According to the Federation of American Scientists, these weapons can be placed into two main categories: incapacitants (including military incapacitants and traditional RCAs) and anti-material agents. (<http://fas.org>).

In addition to defining non-lethal weapons, DoD Directive 3000.3 has two additional purposes. One, it “establishes DoD policies and assigns responsibilities for the development and employment of NLWs.” (DoDD 3000.3) Specifically, it states that NLWs [to include chemicals capable of generating incapacitating effects] should enhance the capability of US forces to accomplish the following objectives:

- 1) Discourage, delay, or prevent hostile actions.
- 2) Limit escalation.
- 3) Take military action in situations where use of lethal force is not the preferred option.
- 4) Better protect our forces.
- 5) Temporarily disable equipment, facilities, and personnel.

Second, it “designates the Commandant of the Marine Corps as Executive Agent (EA) for the DoD Non-Lethal Weapons Program.” The Commandant exercises this responsibility through the Joint Non-Lethal Weapons Directorate (JNLWD). The directorate acts as a DoD

clearinghouse for coordinating non-lethal weapons requirements. In addition, the JNLWD's website states that the directorate is responsible for "providing the most current and accurate information available on relative aspects of non-lethal technologies to the joint services and other government activities requiring the use of restrained measures in the performance of their mission." (<http://www.jnlwd.usmc.mil/>)

To that end, "DoD is studying the development and use of so-called "calmative" chemicals as well as incapacitants, malodorants, and possibly convulsants." (Knickerbocker, 1) According to the JNLWD website, the directorate sponsored a two-year non-lethal chemicals technology investment program (TIP) that began in 2001. This TIP is a concrete step towards evaluating the feasibility of non-lethal chemical weapons prior to committing to larger, longer-term financial investments. Objectives of the non-lethal chemicals TIP include:

- 1) Identification of substances in the pharmaceutical industry and elsewhere for potential non-lethal applications.
- 2) Conduct military user workshops to identify the range of desired operational effects.
- 3) Create a searchable database of potential candidates.
- 4) Provide a list of promising candidates to the Judge Advocate General's office for preliminary legal review.

Non-lethal chemical weapons are broken down into two main categories based largely on the duration of their effect. Chemical weapons known as incapacitants form the first of these two divisions. Army Field Manual (FM) 8-9 NATO Handbook on the Medical Aspects of NBC Defensive Operations, Part III, provides the current US military definition of incapacitants. According to FM 8-9, "an incapacitant is a chemical agent which produces a temporary disabling condition that persists for hours to days after exposure to the agent has occurred (unlike that

produced by riot control agents).” (FM 8-9, Para 601) The manual continues by listing five characteristics of chemical incapacitants:

- 1) Highly potent (an extremely small dose if effective) and logistically feasible.
- 2) Able to produce their effects by altering the higher regulatory activity of the central nervous system (CNS).
- 3) Of a duration of action lasting hours or days, rather than of a momentary or fleeting action.
- 4) Not seriously dangerous to life, except at doses many times the effective dose.
- 5) Not likely to produce permanent injury in concentrations which are militarily effective.

In addition to these characteristics, chemical incapacitants are placed in one of two categories depending on their effect on the CNS. The CNS consists of the brain, spinal cord, and spinal nerves.

CNS depressants make up the first category of incapacitants. CNS depressants produce their effects by interfering with the transmission of information across central synapses. (FM 8-9, Para 602). In other words, CNS depressants interfere with nerve cells “talking” to one another. An example of a CNS depressant is 3-quinuclididynyl benzilate, or BZ. Weaponized by the US in the 1960s, BZ is capable of producing numerous CNS effects. These effects include stupor, confusion, and confabulation with concrete and panoramic illusions and hallucinations, and regression to automatic “phantom” behaviors such as plucking and disrobing. (Medical Management of Chemical Casualties Handbook, 137) In addition to generating these effects, BZ is a relatively safe incapacitant. The amount required to produce effects is a thousand or more fold less than a fatal dose of the compound. The  $IC_{50}$  (the Ct product needed to produce incapacitation in 50% of an exposed group) for BZ is  $112 \text{ mg-min/m}^3$ , whereas the  $LC_{50}$  is estimated to be  $200,000 \text{ mg-min/m}^3$ . (Medical Management of Chemical Casualties Handbook,

144) Despite its CNS effects and relative safety, the US military never used BZ due to its unpredictable effects in humans. (Center for Nonproliferation Studies, 2) The US began destroying its stocks in 1988 and the destruction is now complete. (Medical Management of Chemical Casualties Handbook, 139).

CNS stimulants are the second category of incapacitants. In contrast to CNS depressants, CNS stimulants cause excessive nervous activity by facilitating the transmission of impulses. (FM 8-9, Para 603) In other words, CNS stimulants cause nerve cells to talk to each other too much. An example of a CNS stimulant is D-lysergic acid diethylamide, or LSD. The US Army's Chemical Corps investigated the use of LSD as an incapacitating agent during the 1950s and early 1960s. (Mechem, 2). LSD facilitates neural activity in the reticular activating system of the brain stem. (FM 8-9, Para 617) As a result, sensory inputs reach the brain regardless of their importance or relevance. LSD exposure can cause a subject to experience simultaneous emotions, hallucinations, and mixed sensory perceptions. These effects can last for days and obviously have a negative impact on the ability of individuals to perform military tasks. However, because LSD is unstable chemically, as well as having marginal incapacitation efficacy, it is not considered a good chemical incapacitant. (Mears, 16) The US military never weaponized LSD.

RCAs are the second main category of non-lethal chemical weapons. "RCAs, also called irritants, lacrimators, and tear gas, produce transient discomfort and eye closure to render the recipient temporarily incapable of fighting or resisting." (Medical Management of Chemical Casualties Handbook, 162) Article II of the CWC more broadly defines RCAs as "chemicals which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure." (CWC, Article II) While RCAs generate incapacitating effects, they are not considered incapacitants in a military sense

because their effects do not last long. The best known RCA is CS, or tear-gas. Given its high safety margin, CS is widely used by law enforcement agencies for riot control. Militaries also use CS as a training aid for teaching troops the proper wear of protective masks.

Regardless of whether a chemical is classified as an incapacitant or an RCA, the military development and employment of non-lethal chemical weapons is controversial. On one hand, some argue that the CWC is sufficiently permissive to support the military development of non-lethal chemical weapons. For instance, one of the purposes for chemical agents not prohibited by the treaty is “law enforcement including domestic riot control purposes.” RCAs fall under this exception. Again, Article II of the CWC defines an RCA as “any chemical not listed in a Schedule, which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure.” (CWC, Article II)

While the CWC prohibits the use of RCAs as a method of warfare, Malcolm Dando, Professor of International Security at the University of Bradford, United Kingdom, raises an interesting point. In short, Dando poses the question, “when...does law enforcement end and a method of warfare begin?” (Dando, 34) “Some proponents of using riot control agents overseas argue that law enforcement allows for military missions such as peacekeeping and counterterrorism.” (Boyd, 1)

In addition to this favorable interpretation of the CWC, proponents of non-lethal chemical weapons development point to conditions where US military use of RCAs is permitted by Executive Order 11850. Signed by President Ford in 1975, (pre-dating US signature of the CWC in 1993), Executive Order 11850 renounces US first-use of RCAs in warfare except in defensive military modes to save lives such as:

- (a) Use of riot control agents in riot control situations in areas under direct and distinct U.S. military control, to include controlling rioting prisoners of war.
- (b) Use of riot control agents in situations in which civilians are used to mask or screen

attacks and civilian casualties can be reduced or avoided.

(c) Use of riot control agents in rescue missions in remotely isolated areas, of downed aircrews and passengers, and escaping prisoners.

(d) Use of riot control agents in rear echelon areas outside the zone of immediate combat to protect convoys from civil disturbances, terrorists and paramilitary organizations.

Exception b above calls to mind US experiences on the streets of Mogadishu, Somalia, where clan members hid behind women and children while attacking US forces. Exception d seems prophetic given recent Iraqi paramilitary/terrorist operations against US supply lines in Operation Iraqi Freedom.

On the other hand, many experts argue that the military development and subsequent wartime employment of non-lethal chemical weapons violates the CWC. To support their argument, opponents of non-lethal chemical weapons cite Article I of the CWC. Article I states:

1. Each state party to this convention undertakes never under any circumstances:
  - a. To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone;
  - b. To use chemical weapons;
  - c. To engage in any military preparations to use chemical weapons

The treaty goes on to define chemical weapons as “toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes.” (CWC, Article II) The treaty further defines toxic chemicals as “any chemical which through its chemical action on life processes can cause death, temporary incapacitation, or permanent harm to humans or animals.” (CWC, Article II) At first glance, it appears that the CWC does in fact preclude the military use of non-lethal chemical weapons. Opponents further argue that US military development of non-lethal chemical

weapons for use in OOTW undermines the spirit and intent of the CWC. Mark Wheelis, a microbiologist at the University of California at Davis argues: “the US military has not publicly made the case that using chemical agents for such activities [peacekeeping, counterterrorism, et al.] would be legal.” (Ruppe, 4)

From the above discussion, it does not appear the JNLWD’s non-lethal chemicals TIP violates the CWC provided the candidate chemicals meet the established criteria for RCAs. While the CWC prohibits the use of RCAs as a method of warfare, the “purposes not prohibited” clause permits the use of chemical weapons (RCAs) for law enforcement purposes. As advanced by Executive Order 11850, the US believes there are situations where the use of RCAs by military forces does not constitute warfare and is therefore acceptable. These situations may arguably include OOTW missions such as peacekeeping and humanitarian assistance operations.

So what does the RCA of the future look like? Currently, opioid anesthetics (anesthetics based on opium) hold the greatest potential in the future development of incapacitating chemicals (Mears, 23) Given in the right amount, opium-based drugs safely induce sleep/unconsciousness. (Center for Nonproliferation Studies, 2) For instance, fentanyl and fentanyl-based compounds are relatively safe and commonly used for anesthesia. Along this line, it is widely believed that the Russians used remifentanyl, a derivative of fentanyl, during the raid on the Moscow theater. (Center for Nonproliferation Studies, 3) “Remifentanyl is rather unique and extremely potent, with relatively fast action but also short duration.” (Center for Nonproliferation Studies, 4) The characteristics of new drugs like remifentanyl blur the differences between those chemicals traditionally classified as military incapacitants and those classified as RCAs. Specifically, with its short duration and absence from CWC Schedules, it can be argued that remifentanyl is more accurately considered an RCA with an incapacitating effect (unconsciousness) versus an incapacitant as currently defined by the US military.

Unfortunately, the deaths of 117 hostages demonstrate the risks associated with the use of any non-lethal chemical on a diverse population. “One major problem is the relative level of effect among combatants and civilians-including children and the elderly who may suffer much worse effects (including death) than stronger and fitter soldiers.” (Knickerbocker, 2)

Fortunately, advances in pharmacology may hold the key for minimizing the risks associated with future generation RCAs. In his paper, “Non-lethal Chemical Incapacitants,” Dr Kevin J. Mears discusses three distinct theories for increasing the safety margin of a given drug. These distinct methods include: targeting drugs for a precise receptor, increasing the potency of the drug, and mixing the drug with its antidote. (Mears, 25) The first theory contends that a drug can be used like a precision munition to target a specific receptor thereby producing the desired effect while avoiding unintended side-effects or collateral damage. In the case of opioids, such a drug would produce unconsciousness without affecting receptors that depress respiration. Next, increasing the potency of a drug reduces unintended side-effects by simply reducing the amount of drug required to achieve the desired effect. Finally, advanced encapsulation techniques may make it possible to deliver the drug and its antidote simultaneously. When introduced at the same time, encapsulation techniques allow the active agents to be absorbed first followed by the antidote. In the case of an opioid, the opioid would be released first followed by a dosage of a common opioid antidote, Naloxone. (Mears, 25)

In conclusion, this paper analyzed several issues related to US military interest in non-lethal weapons with an emphasis on non-lethal chemical weapons. First, this paper established a linkage between non-lethal chemical weapons and WMD. Linkages discussed included the difficulty in separating non-lethal and lethal chemical weapons, the international norm against the use of WMD (to include chemical weapons) as a method of warfare, and the shared limitations of non-lethal and lethal chemical weapons. Next, this essay advanced various reasons

why states seek non-lethal weapons capabilities. The reasons advanced included: increased military involvement in peacekeeping and humanitarian operations, fighting the global war on terror, and the international norm against the use of lethal force promoted by the “CNN effect”. From there, this paper reviewed US military policy and organization for non-lethal weapons development. Specifically, DoD Directive 3000.3 was discussed to clarify DoD policy and organizational responsibilities for the development of non-lethal weapons (to include non-lethal chemical) capabilities. Emphasis then shifted to recent JNLWD efforts to explore non-lethal chemical technologies through a formal technology investment program. After that, this paper identified incapacitants and RCAs as the two major categories of non-lethal chemical weapons and described their characteristics. Finally, this paper examined the CWC and Executive Order 11850 with regard to the legal issues surrounding the US development of non-lethal chemical weapons. This paper asserts that preliminary DoD efforts to develop non-lethal chemical technologies do not appear to violate the CWC. However, any such chemicals must meet the CWC criteria for RCAs. Finally, recent efforts in developing incapacitating chemicals and theories for improving their safety were discussed.

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